

Fabrication of Partially Transparent Petaled Masks Using Gray Scale Lithography

Completed Technology Project (2012 - 2013)



Project Introduction

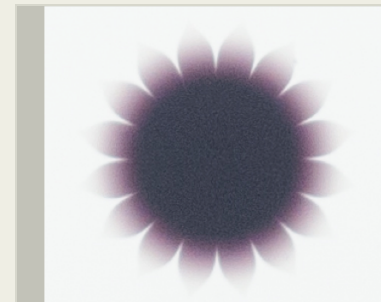
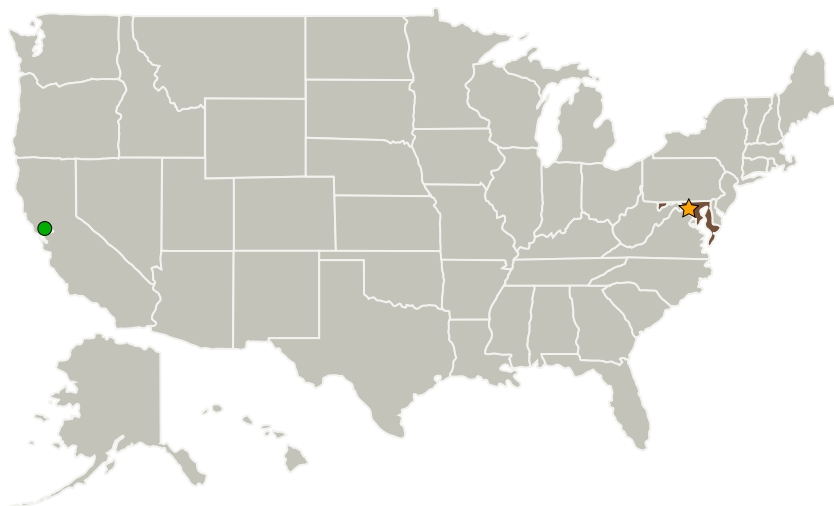
In this study we intend to fabricate partially transparent petal (PTP) masks using gray scale lithography on high-energy beam sensitive (HEBS) glass and evaluate its performance in on-going light suppression experiments at Goddard. Preliminary laboratory results from traditional lithography fabricated masks and our published mathematical analyses show PTP masks using gray scale lithography could achieve superior light suppression along the optical axis not obtainable with binary petaled masks. The fabrication process involving low cost gray scale lithography would enable NASA to assess the feasibility of this technology as a means of achieving 3D micro/nano fabrication processes for future device manufacturing.

Our main objective in this study is to design, fabricate, and analyze the partially transparent petaled (PTP) masks using gray scale lithography to suppress the diffracted light along the optical axis of secondary mirror of the New Space-based Gravitational-wave Observatory (NGO) telescope.

Anticipated Benefits

N/A

Primary U.S. Work Locations and Key Partners



Close up of mask

Table of Contents

Project Introduction	1
Anticipated Benefits	1
Primary U.S. Work Locations and Key Partners	1
Images	2
Organizational Responsibility	2
Project Management	2
Project Website:	3
Technology Maturity (TRL)	3
Technology Areas	3

Fabrication of Partially Transparent Petaled Masks Using Gray Scale Lithography

Completed Technology Project (2012 - 2013)



Organizations Performing Work	Role	Type	Location
★Goddard Space Flight Center(GSFC)	Lead Organization	NASA Center	Greenbelt, Maryland
●Ames Research Center(ARC)	Supporting Organization	NASA Center	Moffett Field, California
George Washington University	Supporting Organization	Academia	Washington, District of Columbia
University of Delaware	Supporting Organization	Academia	Newark, Delaware

Primary U.S. Work Locations

Maryland

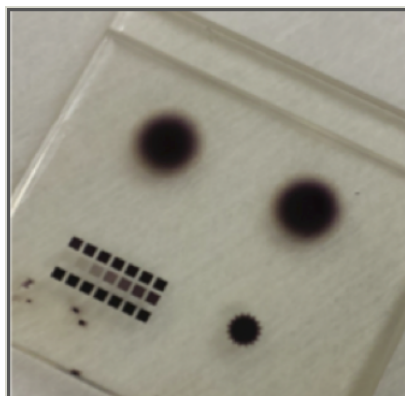
Images



Fabrication of Partially Transparent Petaled Masks Using Gray Scale Lithography Project

Close up of mask

(<https://techport.nasa.gov/image/4093>)



Fabrication of Partially Transparent Petaled Masks Using Gray Scale Lithography Project

Grayscale lithography fabricated mask on HEBS glass

(<https://techport.nasa.gov/image/4094>)

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Goddard Space Flight Center (GSFC)

Responsible Program:

Center Innovation Fund: GSFC CIF

Project Management

Program Director:

Michael R Lapointe

Program Manager:

Peter M Hughes

Project Manager:

Terence A Doiron

Principal Investigator:

Ron S Shiri

Fabrication of Partially Transparent Petaled Masks Using Gray Scale Lithography

Completed Technology Project (2012 - 2013)

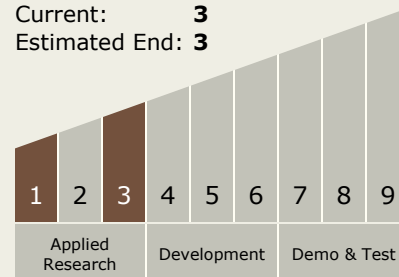


Project Website:

<http://aetd.gsfc.nasa.gov/>

Technology Maturity (TRL)

Start: **1**
Current: **3**
Estimated End: **3**



Technology Areas

Primary:

- TX12 Materials, Structures, Mechanical Systems, and Manufacturing
 - └ TX12.4 Manufacturing
 - └ TX12.4.3 Electronics and Optics Manufacturing Process